Disaggregation of Water Management Detail in a Model of the Sacramento Valley

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Presentation Outline

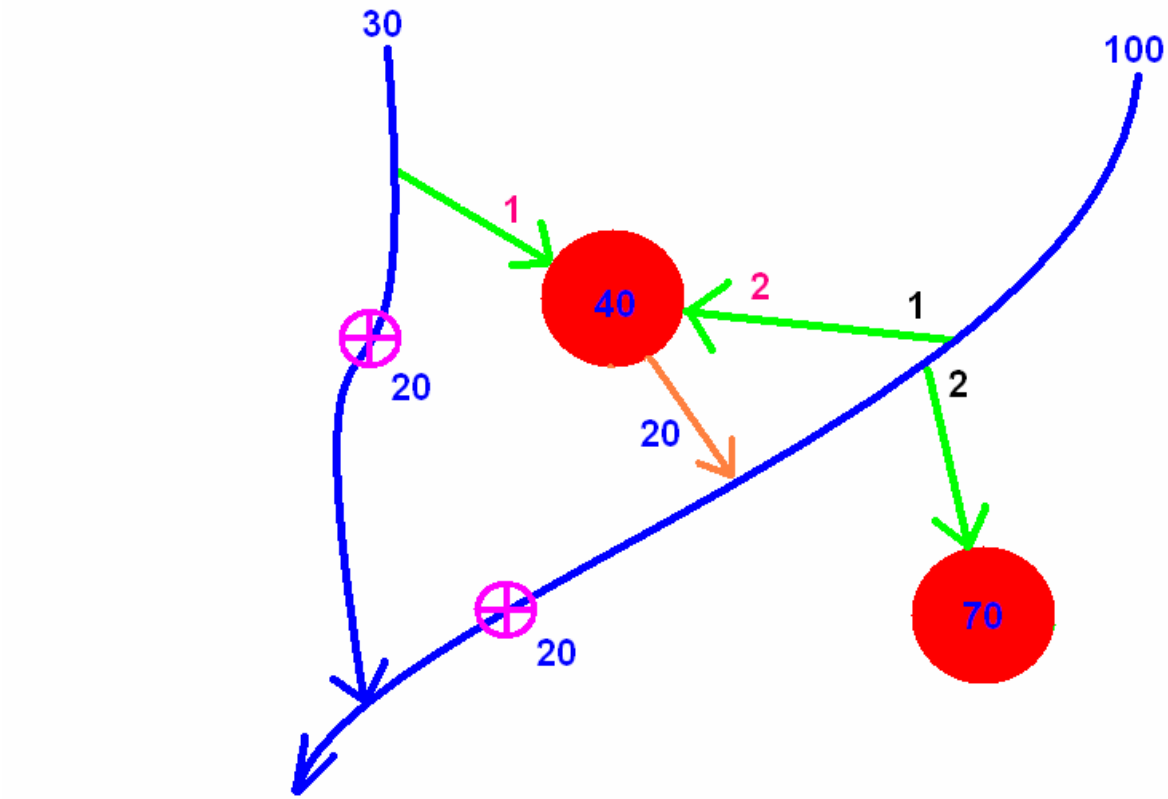
- NHI-DWR Collaboration
- Water Evaluation And Planning (WEAP) Model
- Sacramento Basin WEAP Application
- Model Refinements

State Water Plan Tool Building

- Quantitative assessment of climate change impacts for next water plan
- WEAP model:
  - Climate driven hydrology
  - Considers population and land use pressures
- Modify existing WEAP application of Sacramento Basin:
  - Disaggregate demands
  - Add G-Model delta salinity

What is WEAP?

A Simple System



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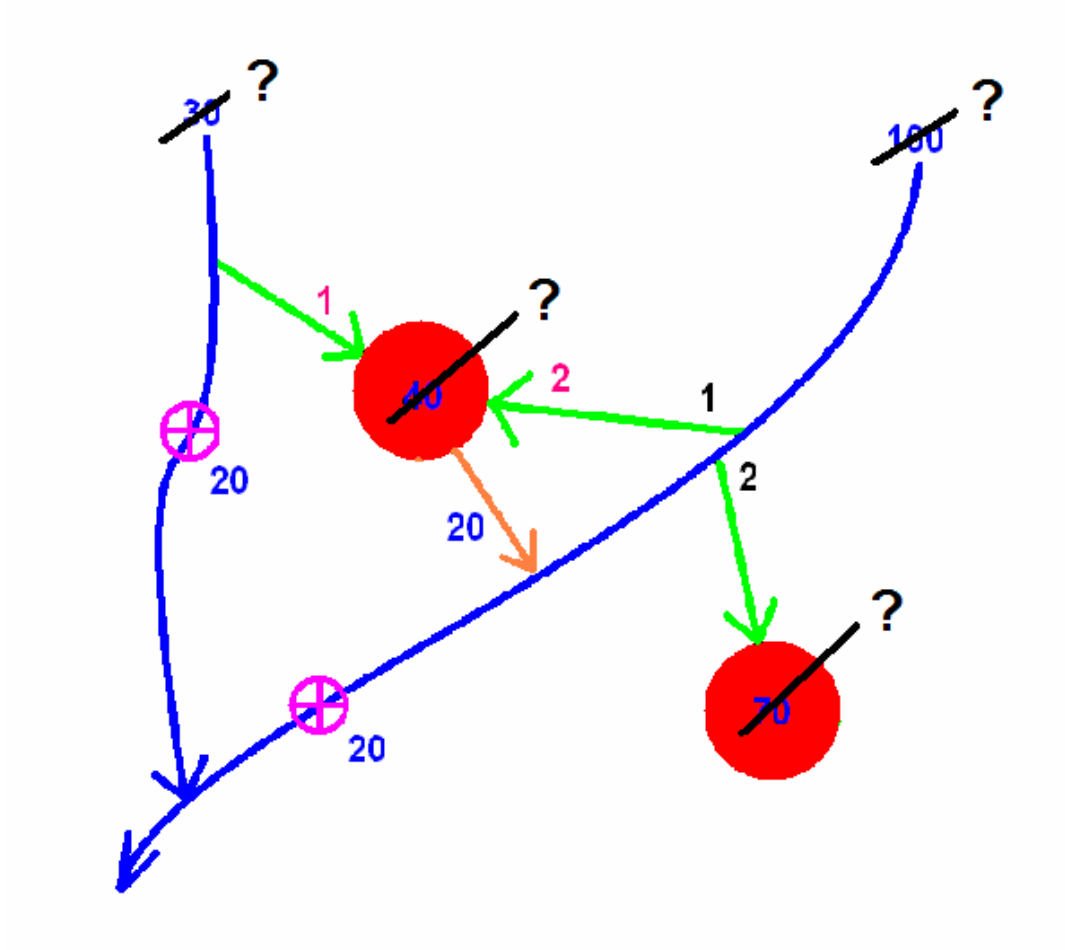
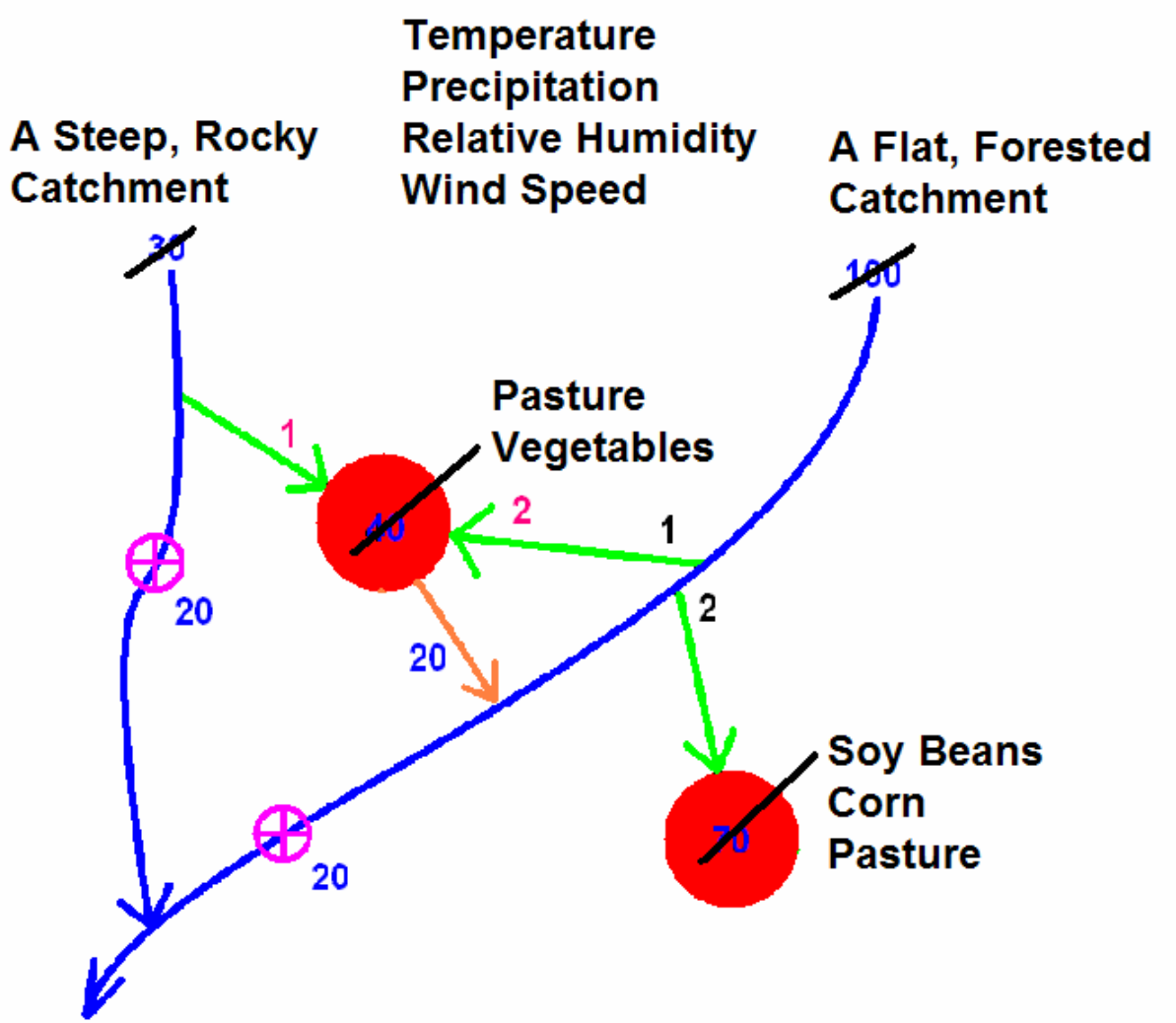
2. That we know how much water is flowing into or out of the river as it moves downstream.
3. That we know what the water demands are with certainty.
4. Basically, that this system has been removed from its **HYDROLOGIC** context.

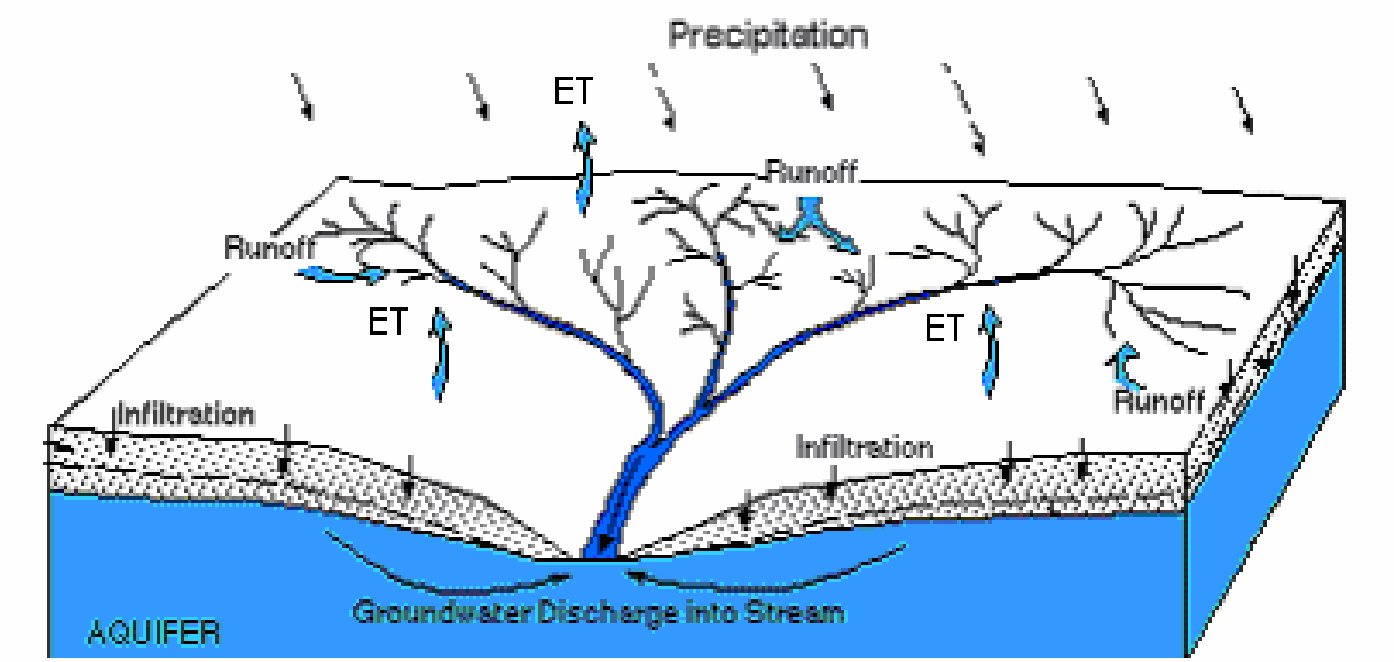
What do we do now?



ADD HYDROLOGY!



Hydrology Model

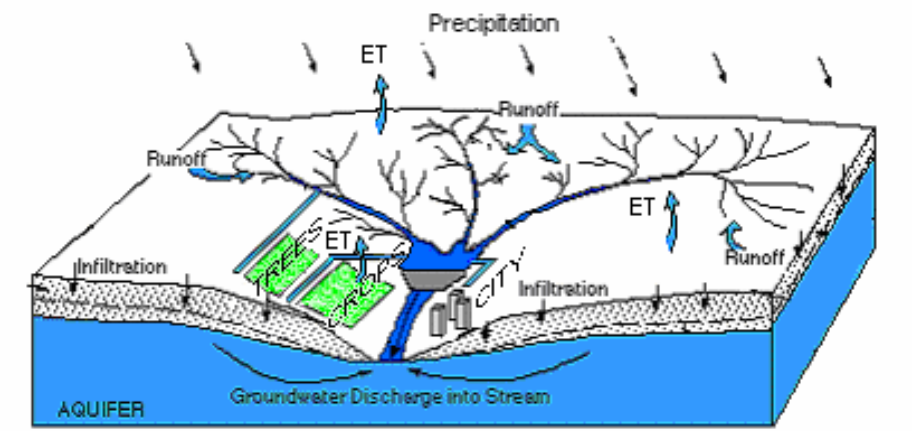


Critical question: How does rainfall on a catchment translate into flow in a river?

Critical question: What pathways does water follow as it moves through a catchment? Runoff? Infiltration? ET? Seepage?

Critical question: How does movement along these pathways impact the magnitude, timing, duration and frequency of river flows?

Planning Model



Critical question: How should water be allocated to various uses in time of shortage?

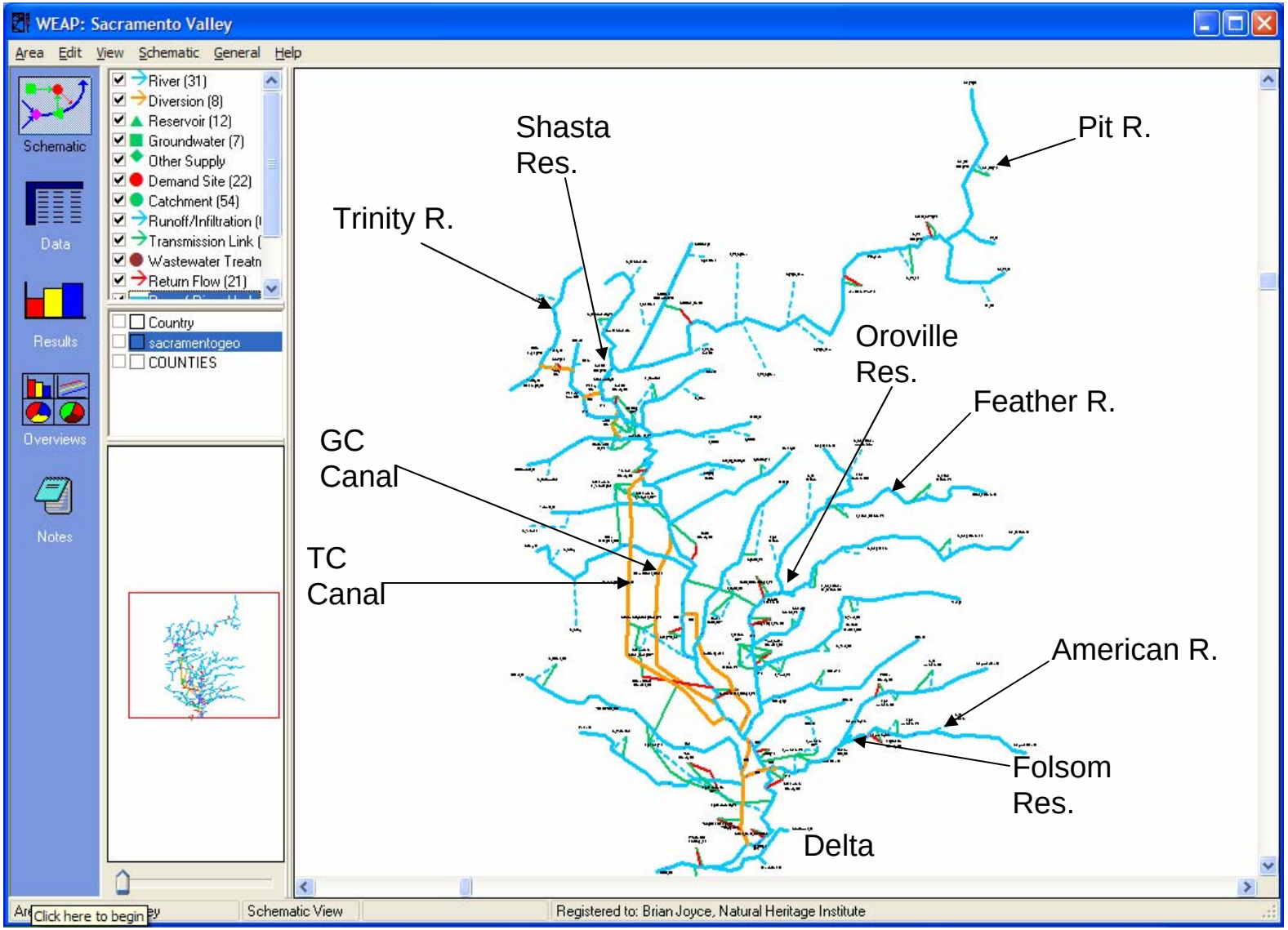
Critical question: How can these operations be constrained to protect the services provided by the river?

Critical question: How should infrastructure in the system (e.g. dams, diversion works, etc) be operated to achieve maximum benefit?

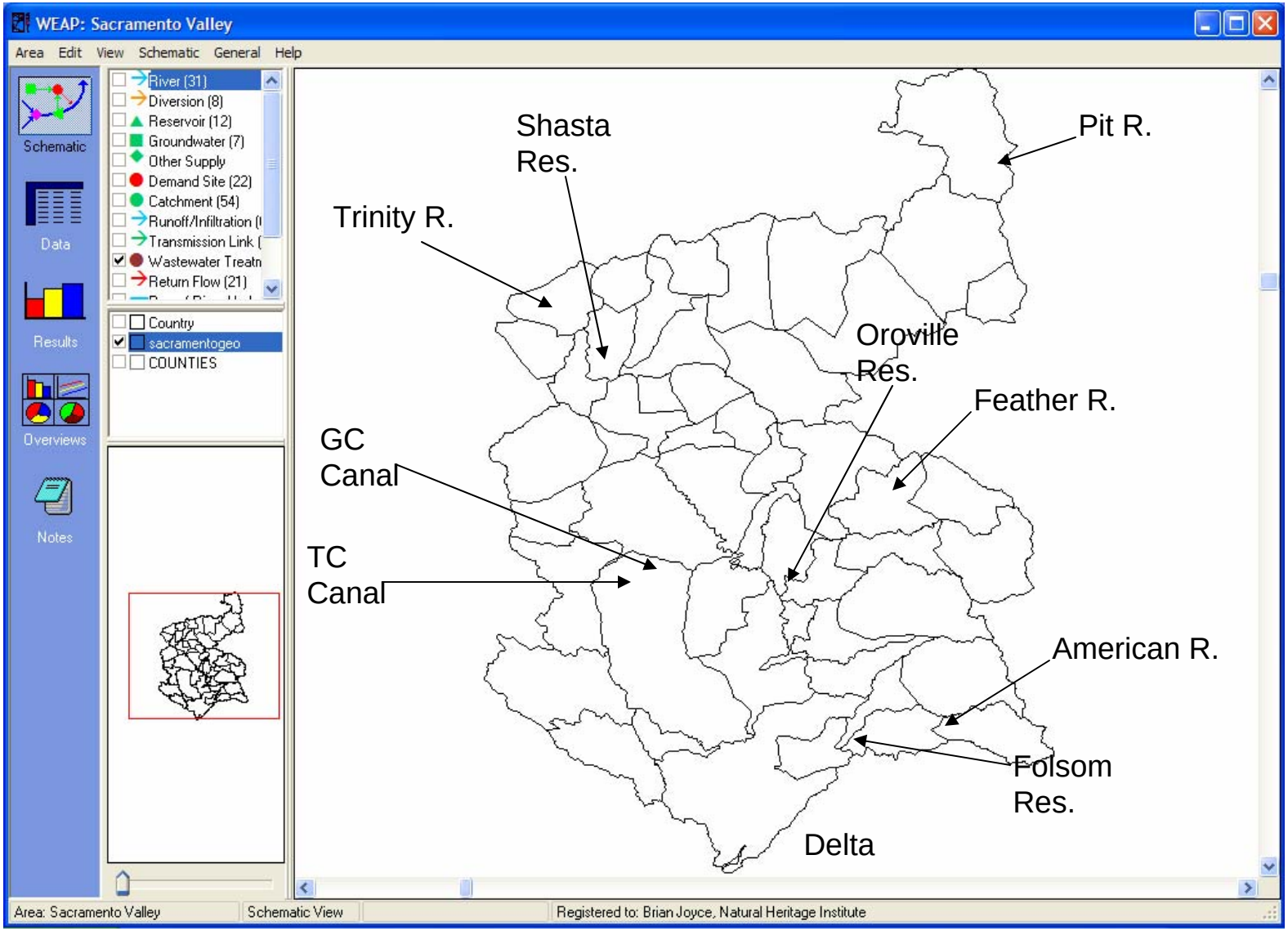
Critical question: How will allocation, operations and operating constraints change if new management strategies are introduced into the system?

WEAP, with its integrated Hydrology Model, provides a framework for answering both set of questions.

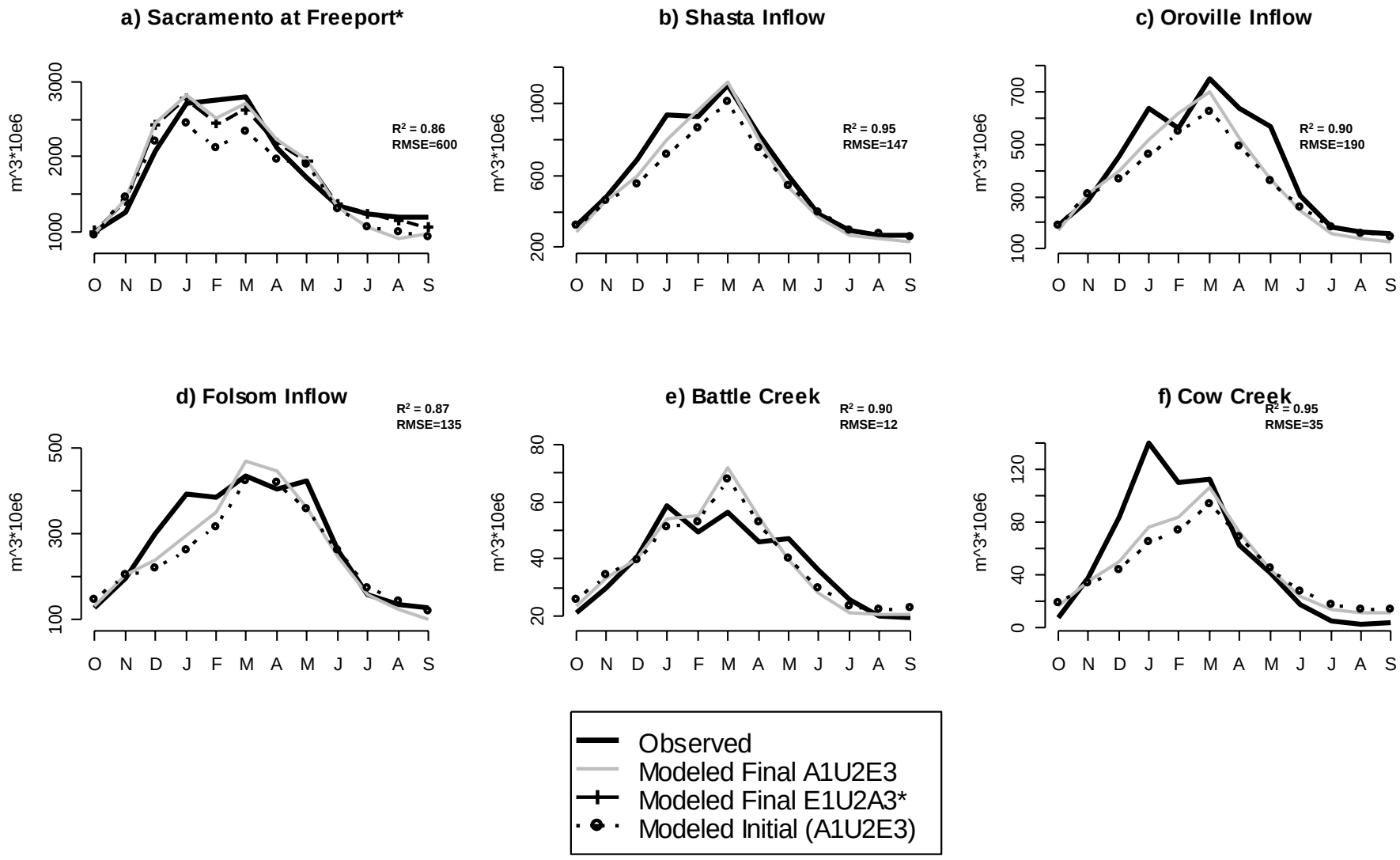
WEAP: Sacramento Basin Model Schematic



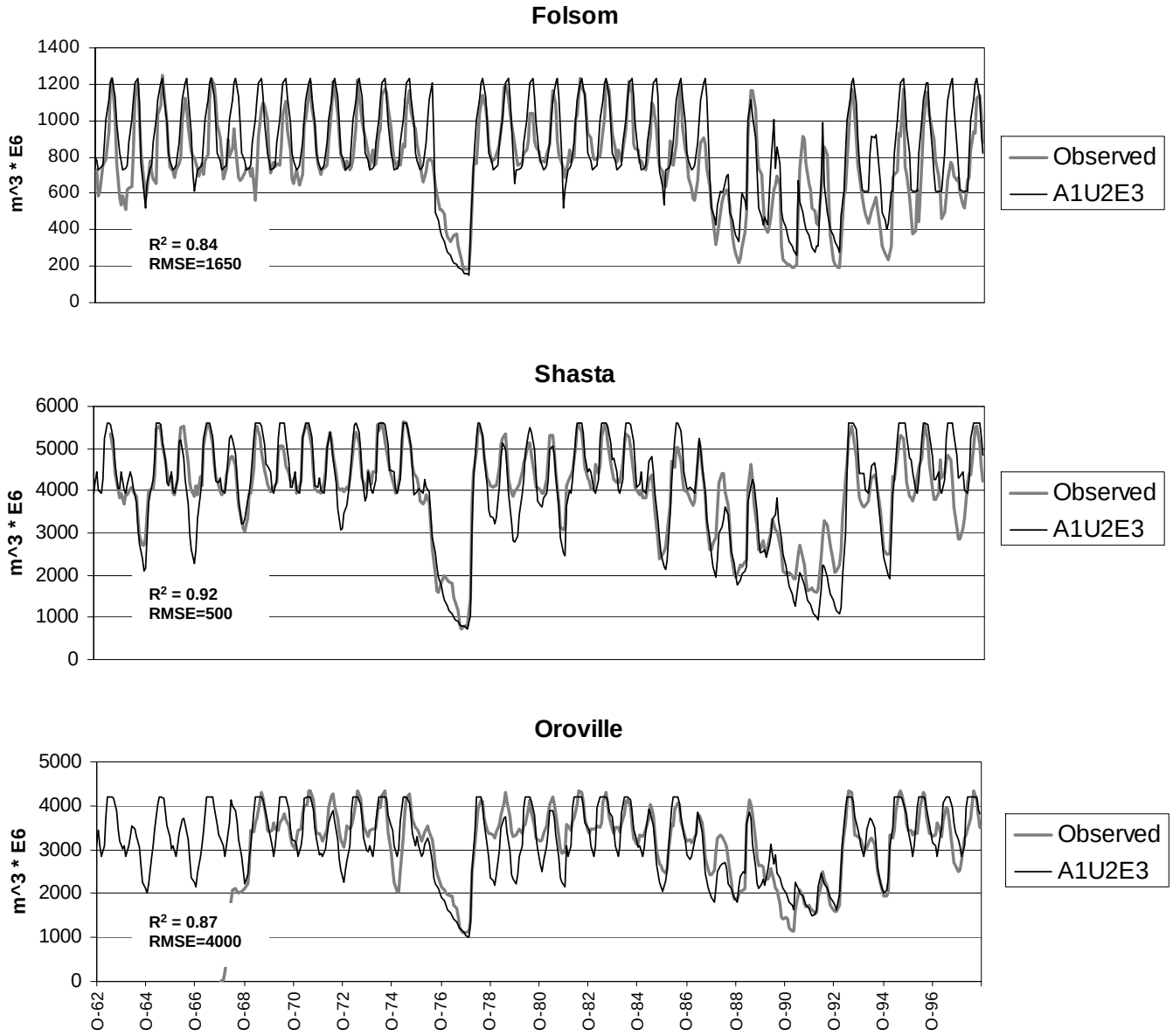
WEAP: Sacramento Basin Model Hydrology



Observed and model simulated average monthly streamflow for 6 select locations throughout the Sacramento Basin



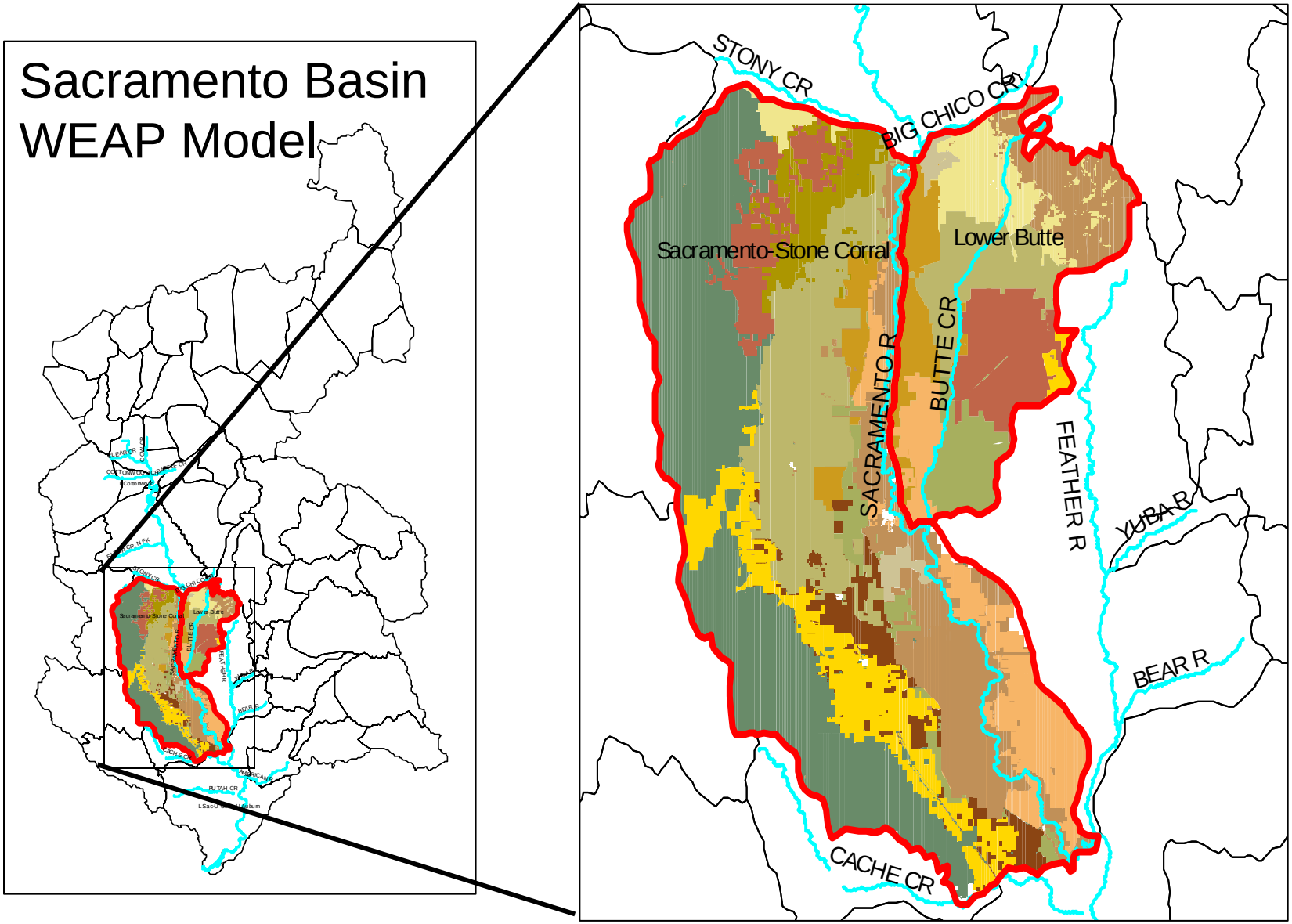
Observed (thick, light line) and simulated storage for Folsom, Shasta and Oroville Reservoirs.



Model Refinements: Spatial Disaggregation

- Case study: only one HUC selected as first approach
  - Sacramento-Stone Corral HUC = Planning Area 506
- Disaggregation/Grouping criteria
  - Water source access
  - Contract type
  - Cropping pattern
  - Dominant soil type
  - Proximity to river
- Calibration

Model Refinements:
Spatial Disaggregation (cont.)



Water Budget for Colusa Basin - 1998 (Stone Corral HUC)

Item	DWR Estimate for PA 506	WEAP Model, Stone Corral HUC	
	Colusa Basin	Aggregated	Disaggregated
Precipitation	3,383	3,396	3,396
Project Deliveries			
Central Valley Project:: Base Deliveries	889	1,492	1,085
Central Valley Project:: Project Deliveries	211		
Other Federal Deliveries	1		
TOTAL	1,101		
Groundwater Extractions	334	240	343

*units = TAF

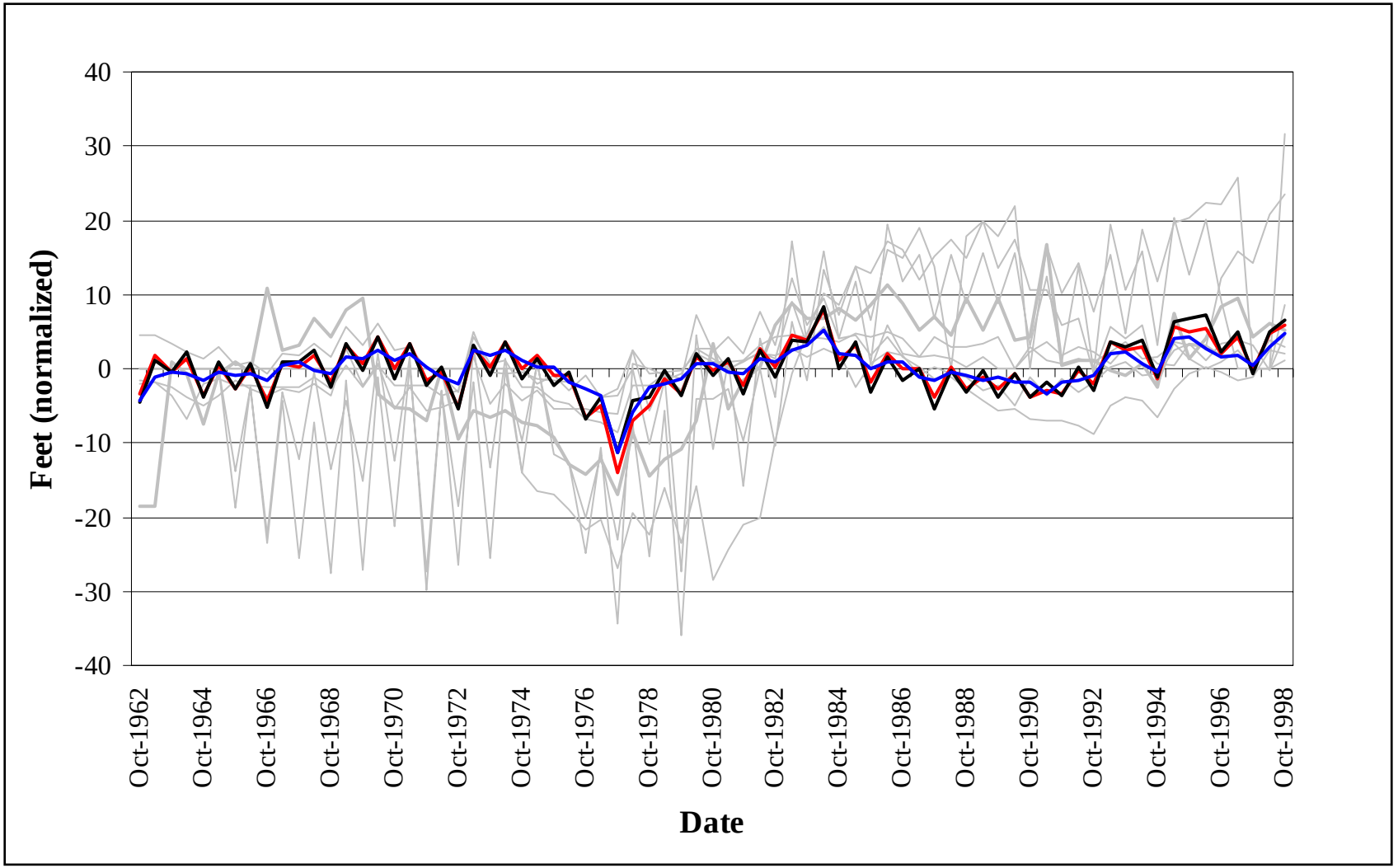
CVP Contractors:
WEAP vs. Historic Deliveries

User		Years										Average
		1994		1995		1996		1997		1998		Error
Glenn-Colusa ID	Historic	589		573		548		583		528		
	WEAP	594	1%	482	-16%	557	2%	592	2%	459	-13%	-5%
Tehama Colusa Canal Authority North	Historic	58		87		107		105		68		
	WEAP	134	131%	105	21%	124	16%	134	28%	96	41%	47%
Tehama Colusa Canal Authority South	Historic	77		88		100		121		82		
	WEAP	119	55%	110	25%	117	17%	118	-2%	103	26%	24%
Stone Corral Settlement Contractors close to Sacramento	Historic	408		385		378		426		308		
	WEAP	451	11%	359	-7%	414	10%	451	6%	332	8%	5%
Stone Corral Settlement Contractors far from Sacramento	Historic	67		75		94		98		64		
	WEAP	122	82%	100	33%	115	22%	122	24%	96	50%	42%
Total CVP Deliveries - Stone Corral HUC	Historic	1199		1208		1227		1333		1050		
	WEAP	1420	18%	1156	-4%	1327	8%	1417	6%	1086	3%	6%

*units = TAF

**relative error terms = deviation from Historic values

GW levels Stone Corral Aquifer



Notes:
Light thin lines: selected wells in the Colusa Basin
Black thick line: aggregated model after calibration
Blue thick line: disaggregated model no calibration
Red thick line: disaggregated model with calibration

Ongoing Work

- Disaggregation of other HUC’s within the Sacramento Valley
- Addition of G-Model representation of delta salinity


Thank You